REMARKS

Claims 1-28 stand rejected and remain pending in the subject patent application.

Objection to the Claims

Claim 14 was objected to in that an “a” should precede the use of “first error value” and “second error value”. Claim 14 has been amended as suggested by the examiner.

Claim 13 is being amended for the same reason.

Rejection Under 35 U.S.C. §112

Applicants appreciate the identification of typographical errors by the examiner in this section of the Office Action.

Claim 14 stands rejected under the second paragraph of 35 U.S.C. §112 because the second occurrence of “generating a first error value” should read “generating a second error value”. The appropriate correction has been made.

The rejection of claim 1 has been overcome by changing “the angle” to “an angle” and “the length” to “a length” in the preamble.

The rejections of claims 2 and 3 have been rendered moot by changing “the point” to “a point” in line 2 of claim 2 and in line 3 of claim 3.

The rejection of claim 5 has been overcome by changing “the angle” to “an angle” and “the length” to “a length” in the preamble.

With respect to the rejection of claim 8, the amendment of parent claim 5 provides an antecedent basis for the terms “the angle of the member” in line 6 and “the length of the member” in line 8. The term “the pitch angle” in line 7 has been changed to “a pitch

angle", and "the angular pitch velocity" in line 8 has been changed to "an angular pitch velocity". These corrections of typographical errors render the rejection moot.

The amendment of parent claim 5 provides an antecedent basis for "the length of the member" in claim 10.

The amendment on parent claim 5 also provides an antecedent basis for "angle of the member" and "the length of the member" in claim 12.

The amendment on parent claim 5 provides an antecedent basis for "the angle of the member" in claim 16.

The rejection of claim 20 has been overcome by changing "the length" to "a length" in line 13.

The rejection of claim 25 has been overcome by changing "the angle" to "an angle" and "the length" to "a length" in the preamble.

Regarding claim 28, the phrase "of the machine" in line 3 has been deleted and the amendment of parent claim 25 provides an antecedent basis for "the length of the member".

Double Patenting Rejection

Claims 1, 5, 20 and 25 were rejected on the basis of nonstatutory obviousness-type double patenting as being unpatentable over claim 10 of U.S. Patent No. 7,093,383. The rejection contends that the cited claims of the present application are generic to the species covered by claim 10 of the patent.

The two inventions in the present application and the 7,093,383 patent are not only patentably distinct, they relate to totally different methods. The method recited in the claims of the present application pertains to controlling movement of a member in response

to a command that designates a desired velocity at which a point on the member is to travel along a straight line. However, to achieve that motion a first actuator alters the angle of the member with respect to a reference and a second actuator alters the length of the member. Thus in order to produce the desired straight line motion, the command is transformed into a desired first velocity of the first actuator and a desired second velocity of the second actuator.

In contrast, the method described in the 7,093,383 patent keeps a load on a load carrier 18 level as the boom 13 pivots up and down in an arc (column 1, lines 18-21) and does not relate to straight line motion. As a result the patent's claim 10 cited as the basis for this rejection does not mention anything close to:

> "producing a command which designates a desired velocity that a point on the member is to travel along a desired substantially straight line path;"

which is the first step in pending independent claims 1 and 5 and is the command produced by the input device in apparatus claim 25. The closest concept in the reference claim 10 is:

> "receiving a boom velocity command which designates a desired linear velocity <u>for the lift hydraulic actuator</u>;" (emphasis added).

However the lift hydraulic actuator corresponds to the first actuator in the pending claims and thus is not the "member". Nor does the linear velocity for the lift hydraulic actuator (16) produce motion of the member (boom 13) along a substantially straight line path. Instead the lift hydraulic actuator in the '383 patent rotates the boom about pivot point 17 (see preamble of patent claim 10) and thus points on the boom travel in an arc. The load carrier velocity command produced at the tenth step in the claim 10 of the '383 patent also does not specify a velocity of a member along a substantially straight line path. The load carrier actuator 76 referred to in this step pivots the load carrier 18 in an arc about the end

of the boom 13. Therefore nothing in the prior patent produces the command referred to in the claims of the present application.

Furthermore, the presently pending claims recite transforming the command for straight line velocity into a desired first velocity of the first actuator and into a desired second velocity of the second actuator. In claim 10 of the '383 patent, the command that is received at the first step already defines the velocity of the first actuator, the lift hydraulic actuator, that pivots the boom. No transformation of that velocity command is needed nor stated for the first actuator in that claim. Thus the method claimed in the 7,093,383 patent does not have nor does it suggest this transformation step in the pending claims.

The method in claim 20 recites designating a first desired velocity that a point on the member is to travel along a first axis and designating a second desired velocity that the is to travel along a second axis which is orthogonal to the first axis. Nothing in claim 10 of the 7,093,383 patent designates velocities of a point along two orthogonal axes. The claim's angular boom velocity and load carrier velocity are in polar coordinates and not along not orthogonal axes. Nor is the linear velocity of the lift cylinder along an axis that is orthogonal to another stated velocity axis. Claim 20 also specifies converting the desired angular velocity for the member into a desired first velocity of the first actuator and as discussed above, claim 10 in the cited patent does not perform that conversion.

In view of these significant and unobvious distinctions between the claims in the pending application and the claims in U.S. Patent No. 7,093,383, the double patenting is without merit and must be withdrawn.

Objection to the Drawings

The drawings were objected to "because they include the following reference character(s) not mentioned in the description: Fig. 1, element 110." The undersigned is unable to find reference numeral 110 in Figure 1. Numeral 110 is used in paragraph [0035] of the application to refer to the second summation node 110 in Figure 3. All the reference numerals appearing in Figure 1 are used in the written description. Therefore, applicants do not know what correction of Figure 1 is needed.

Rejection Under 35 U.S.C. §102

Claims 1-7, 9-13, 15-18 and 20-28 stand rejected under 35 U.S.C. §102 as being anticipated by Brandt *et al.*

The Brandt *et al.* patent and the present claims control motion of a boom (a member) that is pivoted up and down by a first actuator and that is telescoped in length by a second actuator. Both control methods respond to a straight line motion command by operating a boom pivot angle actuator and a boom length actuator, however they do so in very different ways.

The method described in the present application has the following basic steps:

1. designating a desired straight line velocity for a point on a member;
2. converting the straight line velocity into a desired angular velocity and a desired length velocity;
3. *transforming the desired angular velocity into a desired first velocity of the first actuator*; and
4. using the desired first velocity to operate the first actuator and using the desired length velocity to operate the second actuator.

Thus the presently claimed method is velocity based.

The fundamental steps of the Brandt *et al.* method are:

1. designating a desired straight line velocity for a point on a member,
2. converting the straight line velocity into a desired angular velocity and a desired length velocity (Fig. 3, step 320);
3. *transforming the desired angular velocity and the desired length velocity into flow percentages that apportion fluid between the first and second actuators* (step 360);
4. using the flow percentages to open valves for each actuator (step 380).

Brandt *et al.* uses flow control and importantly does have the third step of the present method in that it does not determine a desired first velocity for the first actuator that pivots the member. Deriving flow percentages merely determines the ratio of how much of the available flow goes to the first actuator in comparison to how much of the available flow goes to the second actuator. Therefore the flow percentages define a relationship between the relative amounts of fluid flow applied to the first and second actuators. That relationship maintains the same relative motion of the two actuators 140 and 150 to move the fork 180 in a straight line.

The Brandt *et al.* flow percentages do not indicate the absolute amount of flow to each actuator as the total available flow being apportioned varies with changes in pump output and fluid consumption by other actuators on the machine. Since the absolute flow to each actuator varies, so too does each actuator's velocity. Furthermore the angular velocity of the Brandt *et al.* boom is not the velocity of the linear actuator 140 that produces the angular boom velocity. Although angular boom velocity is geometrically convertible to the linear velocity of the piston rod with respect to the cylinder of the actuator 140, that conversion is not performed by Brandt *et al.* and nowhere does its method derive a desired first velocity for the first actuator 140.

Although both the present invention and the Brandt *et al.* system convert a straight line velocity command into signals for operating a first actuator to pivot a member and a second actuator that alters the member's length, they do so in dramatically different ways.

Specifically with respect to pending claim 1, the command, that designates a velocity of a point on the member along a substantially straight line path, is transformed in the second and third steps into a desired velocity of the first actuator and into a desired second velocity for the second actuator. Thus, the present invention defines the velocities at which each of the two actuators is to move. As noted above, Brandt *et al.* converts the straight line velocity command into a fluid flow relationship for the actuators and does not does not define the velocity of the first actuator that pivots the member 160.

Therefore the cited patent does not teach the essence of the present invention in which the desired velocity at which the point on the member is to move along a straight line is transformed into the velocities at which the first and second actuators must operate to move the point as desired.

As a consequence, claims 1-4 are not anticipated by the Brandt *et al.* patent.

Independent claim 5 and dependent claims 6, 7, 9-13 and 15-18 are not anticipated for similar reasons. Here, the straight line velocity command is processed to derive a desired angular velocity for the member, which angular velocity is in turn converted in the third step to a desired first velocity of the first actuator that produces an angular change of the member. As discussed above, the Brandt system never derives a desired first velocity of the first actuator 140. Instead at block 360, the desired angular velocity for the member 160 is converted directly into a percentage of fluid flow to be applied to the first actuator 140.

Dependent claim 10 further specifies deriving the length of the member by sensing the dimension of the second actuator and converting that dimension into the length of the member. In contrast the Brandt system includes a length sensor 230 that directly senses the length of the telescopic member 170 of the boom (column 3, lines 33-36). Nowhere in the reference is a dimension of an actuator sensed for this length determination.

Claim 15 states that sensing the first parameter, which in claim 12 denotes the angle of the member, is accomplished by sensing a dimension of the first actuator. In contrast, the Brandt system has an angle sensor 210 that directly senses the boom angle relative to the machine frame 130 (column 3, lines 30-33). Therefore the reference does not derive the actual boom angle by sensing a dimension of first actuator 140.

Claim 17 states that sensing the second parameter of the machine in claim 12, which produces a second signal denoting the length of the member, is accomplished by sensing a dimension of the second actuator. As noted regarding claim 10, the Brandt system has a length sensor 230 that directly measures the boom length (column 3, lines 33-37). Therefore, nothing in the reference senses a dimension of the second actuator.

Claim 18 recites sensing parameters of the first and second actuators and deriving the actual velocity of each actuator from those parameters. Nothing in the Brandt patent relates to deriving an actual velocity of the actuator 140 that produces an angular change of the boom. Instead the boom angle is sensed and then processed at box 355 in Figure 3 to derive the actual angular velocity of the boom.

Therefore, claims 5-7, 9-13, and 15-18 are not anticipated under 35 U.S.C. §102.

Independent claim 20 also specifies "converting the desired angular velocity for the member into a desired first velocity of the first actuator", which actuator alters the angle of the member. Because the Brandt system converts the desired angular velocity of the member directly into a fluid flow percentage, not a desired velocity, for the first actuator 140, that reference does not teach the method stated in claim 20.

Dependent claim 21 calls for sensing a dimension of the second actuator which controls the length of the boom. As noted previously, the Brandt system has a length sensor 310 that directly senses the telescopic length or extension of the boom member 170 (column 3, lines 33-37) and does not sense a dimension of an actuator.

Therefore, claims 20-24 are not anticipated by the Brandt patent.

Independent claim 25 recites an apparatus that has a first converter which translates the angular velocity for the member into a first velocity at which the first actuator is to move. As noted above, there is no corresponding converter in the Brandt patent. Instead Brandt's block 360 transforms the desired angular velocity into an percentage of the available fluid flow that is to be applied to the first actuator. Nothing in that patent defines a velocity at which the first actuator 140 is to move. As noted previously, Brandt's first actuator must move at a different linear velocity than the angular velocity of the boom that the actuator drives. As a consequence, claims 25-28 are not taught or anticipated by the Brandt patent.

In light of these significant distinctions between the method and apparatus described in the Brandt *et al.* patent, claims 1-7, 9-13, 15-18 and 20-28 are not anticipated under 35 U.S.C. §102.

Rejection Under 35 U.S.C. §103

Claims 8, 14 and 19 were rejected under 35 U.S.C. §103 as being unpatentable over Brandt *et al.* in view of Igarashi *et al.*

As noted previously with respect to the parent claims from which these claims depend, the Brandt system does not convert the desired angular velocity of the member into a desired first velocity of the first actuator. Nor does the Igarashi patent disclose this feature, in fact, this reference does not even use the word velocity. As a consequence, claims 8, 14 and 19 are patentable for the reasons stated above with respect to claim 5.

Furthermore the specific equations contained in claim 8 are significantly different from the equations recited in the Igarashi, *et al.* patent. The equations in claim 8 among other factors, include the pitch angle of the machine on which the member is mounted and the angular pitch velocity, whereas the equations in the Igarashi patent merely utilize the different angles between the boom, arm, and bucket of an excavator.

Therefore, claims 8, 14 and 19 are not rendered unpatentable under 35 U.S.C. §103.

Conclusion

In view of these distinctions between the subject matter of the present claims and teachings of the cited patents, reconsideration and allowance of the present application are requested.

Respectfully submitted,
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